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# Mélanges and mélange-forming processes: a geological overview

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Geotechnical engineering projects (e.g., excavations, tunneling, landslide remediation, etc.) in “*bimrocks*” (block-in-matrix rocks) units are commonly strongly complicated by their internal chaotic arrangement, which is characterized by a strong mechanical contrast between blocks and the matrix, and their mutual proportion (e.g., Medley, 2008).

Among several “*bimrocks*” type units, *mélanges* represent the most common ones, representing significant components of different geological and geodynamic environments worldwide.

This study presents up-to-date observations and interpretations on various *mélange* types and forming processes from around the world from a geological prospective. The main goals are: (i) to make both the classic and modern concepts in the vast *mélange* geological literature accessible to those geoscientists and engineers, who are not intimately familiar with the complications in studying chaotic rock units or *mélanges*, and (ii) to show that different *mélange* types have different internal block-in-matrix arrangement with significant implications of their mechanical behavior. After the definition of the term *mélange*, we show that different types of processes (i.e., tectonic, sedimentary, and diapiric) and their mutual interplay and superposition, contribute in forming different *mélanges* types. A comparative analysis of exhumed, ancient on-land *mélanges* and modern tectonic environments, allows then to document that close relationships exist between *mélange* types, their related fabric, and the geological-geodynamic environment of their formation (Festa et al., 2010, 2016). In fact, different *mélanges* types are close related with extensional tectonics, passive margin evolution, strike slip tectonics, subduction zones, collisional tectonics, and intra-continental deformational settings. We document that these different *mélange* types are characterized, and can be distinguished each other, by different diagnostic internal fabric and block-in-matrix arrangements (Festa et al., 2019). We therefore discuss the main complication in distinguishing the different diagnostic fabric of *mélanges* when reworked and overprinted by tectonic processes, as commonly occurred in the geological record.

Detailed studies and observations of *mélanges*, the different “block-in-matrix” fabric and the related-processes of formation are significant in better understanding and distinguish different types of “*bimrocks*” encountered in geotechnical engineering projects. Therefore, a close collaboration between geologists with expertise in *mélanges* and engineers is thus fundamental to improve our knowledge and understanding on “*bimrocks*”, reducing the problem of their mechanical characterization, and consequently providing accurate constraints for practical geotechnical characterizations and procedures around the world.

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